AMENDMENT TO THE CLAIMS

Claim 1 (Currently Amended): A solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell, wherein ~~an anion group is combined with a~~ the solid polymer electrolyte membrane ~~over a part of the surface of said membrane, which part is less than an entire surface of said membrane~~ includes anion group combined regions and non-anion group combined regions.

Claim 2 (Currently Amended): A method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell, comprising a step of combining an anion group with a solid polymer membrane over a part of the surface of said membrane, which part is less than an entire surface of said membrane, wherein the solid polymer electrolyte membrane includes anion group combined regions and non-anion group combined regions.

Claim 3 (Previously Presented): A method for producing a solid polymer electrolyte membrane comprising the steps of:

covering a portion on a surface of a polymer substrate with a first mask to shield the portion;

applying radiation to an entirety of the polymer substrate;

grafting a styrene onto a polymer in a remaining portion in the polymer substrate not covered by the first mask;

removing the first mask from the polymer substrate; and

combining an anion group with the styrene on the polymer in the grafted remaining portion of the polymer substrate.

Claim 4 (Previously Presented): A method for producing a solid polymer electrolyte membrane comprising the steps of:

applying radiation to a surface of a polymer substrate;

covering a portion in the radiated surface of the polymer substrate with a mask to shield the portion;

grafting a styrene onto a polymer in a remaining portion of the polymer substrate not covered with the mask; and

combining an anion group with the styrene on the polymer in the grafted remaining portion of the polymer substrate.

Claim 5 (Previously Presented): A method for producing a solid polymer electrolyte membrane comprising the steps of:

applying radiation to a surface of a polymer substrate;

covering a portion of the radiated surface of the polymer substrate with a mask for shielding the portion;

grafting a styrene onto a polymer in a remaining portion in the polymer substrate not covered with the mask;

removing the mask from the polymer substrate; and

combining an anion group with the styrene on the polymer of a surface portion of the portion in the thickness direction thereof.

Claim 6 (Currently Amended): The ~~method for producing the~~ solid polymer electrolyte membrane in accordance with claim 1, wherein the anion group includes a sulfonic acid group.

Claim 7 (Original): The method for producing the solid polymer electrolyte membrane in accordance with claim 2, wherein the anion group includes a sulfonic acid group.

Claim 8 (Original): The method for producing the solid polymer electrolyte membrane in accordance with claim 3, wherein the anion group includes a sulfonic acid group.

Claim 9 (Original): The method for producing the solid polymer electrolyte membrane in accordance with claim 4, wherein the anion group includes a sulfonic acid group.

Claim 10 (Original): The method for producing the solid polymer electrolyte membrane in accordance with claim 5, wherein the anion group includes a sulfonic acid group.

Claim 11 (Previously Presented): The solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 1, wherein said solid polymer electrolyte membrane includes sulfonated regions and non-sulfonated regions.

Claim 12 (Previously Presented): The method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 2, wherein said solid polymer electrolyte membrane includes sulfonated regions and non-sulfonated regions.

Claim 13 (Previously Presented): The method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 3, wherein the first mask includes lead.

Claim 14 (Previously Presented): The method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 4, wherein the mask is formed with polytetrafluoroethylene.

Claim 15 (Previously Presented): The method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 5, wherein the mask is formed with polytetrafluoroethylene.

Claim 16 (New): The method for producing a solid polymer electrolyte membrane with ion exchangeability employed in a solid polymer electrolyte fuel cell in accordance with claim 2, further comprising steps of

covering a portion of the solid polymer membrane with a mask; and

applying radiation to the solid polymer membrane.

SUPPORT FOR THE AMENDMENTS

This Amendment amends Claims 1-2 and 6; and adds new Claim 16. Support for the amendment is found in the specification and claims as originally filed. In particular, support for "anion group combined regions and non-anion group combined regions" is found at least in Claims 8-10 ("the anion group includes a sulfonic acid group") and in Claims 3-5 ("combining an anion group"; "mask"). Support for Claim 16 is found at least in Claims 3-5. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-16 will be pending in this application. Claims 1, 2, 3, 4 and 5 are independent.

REQUEST FOR RECONSIDERATION

In response to the Office Action dated February 25, 2005, favorable reconsideration and allowance of the present application are respectfully requested. The Office Action variously rejects the claims over U.S. Patent No. 5,994,426 ("Nezu"), alone or in view of JP 07050170A ("Okuyama"). It is respectfully submitted that all claims are now in condition for allowance as discussed below.

Conventional solid polymer electrolyte membranes produced by radiation graft polymerization of a polymer substrate have poor mechanical strength and dimensional stability relative to the polymer substrate. Specification at [0010].

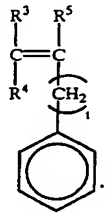
In contrast, the present invention provides a solid polymer electrolyte membrane, produced by radiation graft polymerization of a polymer substrate, that has mechanical strength and dimensional stability comparable to the polymer substrate before the graft polymerization. These improved properties result from forming, in the membrane, regions in which anion groups are combined with the polymer substrate and regions in which the anion groups are not combined with the polymer substrate. See Specification at [0023]; Figs. 1-4.

Claims 1, 6, 11 and 12 are rejected under 35 U.S.C. § 103(a) over Nezu in view of Okuyama. In addition, Claims 2 and 7 are rejected under 35 U.S.C. § 103(a) over Nezu in view of Okuyama. Claims 3-5, 8-10 and 13-15 are rejected under 35 U.S.C. § 102(b) or, in the alternative, under 35 U.S.C. § 103(a) over Nezu.

Nezu discloses a solid-polymer-electrolyte membrane formed of a synthetic resin that includes a main chain and a hydrocarbon-based side chain. The main chain is formed as a film, and formed of a copolymer made from a fluorocarbon-based vinyl monomer and a hydrocarbon-based vinyl monomer. The hydrocarbon-based side chain involves a sulfonic group. Nezu at Abstract. Nezu discloses

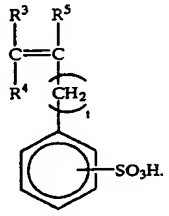
> The hydrocarbon-based side chain containing a sulfonic group can be prepared by graft-polymerizing a polymerizable alkenyl benzene, ***or*** a polymerizable alkenyl benzene containing a sulfonic group, onto the copolymer or the present main-chain resin which is prepared from a fluorocarbon vinyl monomer and a hydrocarbon-vinyl monomer. The polymerizable alkenyl benzene can be expressed by the following chemical formula (3):

(3)



> The polymerizable alkenyl benzene having a sulfonic group can be expressed by the following chemical formula (4):

(4)



Nezu at column 6, line 59 to column 7, line 27.

However, Nezu fails to suggest the limitation of independent Claims 1 and 2 that "the solid polymer electrolyte membrane includes anion group combined regions ***and*** non-anion group combined regions".

Okuyama fails to remedy the deficiencies of Nezu. Applicant respectfully traverses the Office Action's assertion that "Okuyama teach the solid polymer membrane over a part of the surface of the membrane, which part is less than an entire surface of the membrane (abstract)". Office Action at page 3, lines 8-9; page 4, lines 4-5. Okuyama's Abstract discloses:

> A polyethylene film 6 is irradiated with electron (sic) beams, and this film is dipped for reaction in the mixture solvent of styrene (sic)-sulfonic acid sodium deoxidized previously, an acrylic acid. This reactant membrane is water-washed, and dipped in the sulfuric acid solvent to form a sulfonic acid type membrane.

However, Okuyama fails to suggest the limitation of independent Claims 1 and 2 that "the solid polymer electrolyte membrane includes anion group combined regions and non-anion group combined regions".

The cited prior art also fails to suggest the mask features of independent Claims 3, 4 and 5, and of new Claim 16, which depends from independent Claim 2.

Because the cited prior art fails to suggest all the limitations of independent Claims 1-5, the prior art rejections should be withdrawn.

For the reasons set forth herein, it is respectfully submitted that this application is now in condition for allowance. A Notice of Allowance for Claims 1-16 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance he or she is encouraged to contact Applicant's undersigned representative at the below listed telephone number.

Respectfully submitted,

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